

REMARKS

Review and reconsideration on the merits are requested.

Prior to discussing claim amendments and providing arguments for patentability, Applicants would like to characterize the prior art and rejections.

The prior art considered: US 2002/0068192 A1 Moriyama et al (Moriyama); U.S. 6,049,167 Onitsuka et al (Onitsuka); US 6,566,805 Tsai et al (Tsai); US 6,097,147 Baldo et al (Baldo).

The rejections: claims 1-11 and 21-23 as obvious over Moriyama in view of Onitsuka further in view of Tsai. Paragraph 6 of the Action.

Claims 1-11 and 21-23 as obvious over Baldo in view of Onitsuka further in view of Tsai. Paragraph 7 of the Action.

The Examiner's position is set forth in the Action in detail, and will not repeated here except as needed to an understanding of Applicants' traversal.

Characterization of the Prior Art

Moriyama

Moriyama deals with organic EL devices. Moriyama contains a broad teaching as follows:

Generally, the organic EL device is considerably affected by moisture (or water content). Specifically, the organic EL device is accompanied with a defective region causing no luminescence therein (called "dark spots") due to degradation or deterioration of a metal electrode and/or adsorption of water content to impurities in some cases. Such dark spots are gradually enlarged with time by the influence of water content, thus adversely affecting the life of the organic EL device.

Further, in addition to the influence of water content, it has been generally known that oxygen entering the organic EL device oxidizes electrodes and/or organic materials

used therein, thus lowering durability of the organic EL device. Moriyama, [0019] and [0020].

Moriyama's solution to the problem is to provide an oxygen adsorbent disposed between the substrate and the second electrode of the organic EL device. Moriyama [0035].

Thus, rather than addressing the problem as addressed in the present invention, Moriyama is concerned with absorption and/or adsorption of oxygen *within* the luminescent device. Moriyama [0037].

Moriyama makes mention that the organic light emitting layer may be formed by vacuum deposition or spin coating. Moriyama [0047].

Moriyama may hermetically seal the organic EL device to block ambient air, and may use what Moriyama calls a rare gas which may be used to fill a spacing between a sealing housing and the organic EL device to remove gases including oxygen. Moriyama, [0056] and [0058].

Moriyama in no fashion suggests the *process of the present invention*, at best teaching the use of an oxygen absorbent in the final device. Given this emphasis in Moriyama, it is not surprising that in Moriyama there is no concept of sealing or isolating until after the final device is completely formed. See especially Moriyama [0071] and [0082].

In this regard, finally, it should be noted that at most Moriyama would suggest an organic EL device of the structure TE/HTL/LEL/ETL/*back side electrode. See claims 35-44 of the present application.

* TE=transparent electrode; HTL = hole transporting layer; LEL = light-emitting layer; ETL = electron transfer layer

Onitsuka

Onitsuka recognizes the fact that organic EL elements have the problem that they are sensitive to moisture. For example, the presence of moisture can cause separation between the light emitting layer and the electrode layers or degrading of the constituent materials, generating dark spots or failing to maintain light emission. Onitsuka, column 1, lines 27-32.

Onitsuka overcomes certain problems with prior art shield members which involve the use of a filling port and is stated to overcome prior art problems with adhesives, contemplating the use of a UV-curing epoxy resin adhesive.

From the method viewpoint, Onitsuka establishes a working zone which contains an atmosphere of an inert gas which is to be contained in a space between a shield member and a substrate of the EL device, where the inert gas has a water content of up to 100 ppm.

Onitsuka also contemplates a method which can include the steps of heating the components of the organic EL device in vacuum to remove residual water, carrying the components into the inert gas atmosphere while maintaining them dry, leaving the components to stand in the inert gas atmosphere until the residual water contents reach equilibrium with the water content in the inert gas atmosphere, and then performing the Onitsuka joining step.

It is quite clear that Onitsuka only contemplates layer formation in distinct vacuum chambers. See Onitsuka at, for example, column 3, line 36, column 3, lines 65-67, especially column 9, line 27 et seq. and the working examples in Onitsuka which shows that Onitsuka in no fashion contemplates any wet forming step.

Further, a careful review of the “Method” which is described beginning at column 9 of Onitsuka shows that when any sealing or like function (in the sense of the present invention) is performed, the operation is well after disposal of organic layers in the sense of the present claims. Onitsuka, of course, has no appreciation of the need to *simultaneously* control both the *water* content and the *oxygen* content.

As a final point, Onitsuka is not concerned with phosphorescent materials which use a triplet exciton mechanism, rather, Onitsuka is directed only to fluorescent materials.

As is the case with Moriyama and Baldo, the basic organic EL element of Onitsuka has the structure TE/HTL/LEL/ETL/BSE²; see, in this regard, claims such as claims 35-44.

Tsai

Tsai deals with organic EL devices, especially to a flexible OEL device and a process for forming the same.

Tsai seems to basically teach that in the situation where the OEL involves a plastic substrate, the plastic substrate cannot effectively prevent water and oxygen from entering because of its low packing density, which also causes the absorption of water and oxygen, and that the organic film formed in the organic electro-luminescent device is sensitive to water and oxygen, so that the organic film would be damaged by water and oxygen, resulting in a decrease in the lifetime of the OEL. Tsai also points out that the water and oxygen **contained in the**

² TE=transparent electrode; HTL = hole transporting layer; LEL = light-emitting layer; ETL = electron transfer layer; BSE = back side electrode

material are often released during vacuum deposition. See Tsai at column 2, lines 3-19 and column 3, lines 3-18.

In a fashion different from the present invention, Tsai proposes, to stop the water and oxygen **released or penetrated from the plastic substrate** by forming a topcoat and an undercoat on the transparent conductive electrodes of the Tsai small molecule and/or polymer organic electroluminescent device. The topcoat and the undercoat serve as a water and oxygen barrier layer and a hard protecting layer for the transparent electrodes of the Tsai OEL.

It is easily seen that while Tsai does speak of OEL devices being sensitive to water and oxygen, these are devices which involve a plastic substrate where it seems that the water and oxygen originate, i.e., it is an internal plastic substrate problem with Tsai, **not an external air problem as in the present invention.** Further, the Tsai solution to the problems Tsai perceives is entirely different from that of the present invention.

While Tsai does mention spin coating, this seems to be only for the LEL (see, for example, Tsai at column 2, line 64, the discussion of prior art and also column 4, line 36).

Tsai in no fashion emphasizes light emission by a triplet exciton mechanism, while Tsai does mention small molecule and polymer luminescent materials.

While Tsai provides no detail, other than the Tsai transparent substrate and dual layer composite system, the Tsai device basically seems to comprise a transparent electrode with what Tsai calls an electro-emitting layer (EML) 208. Tsai at column 6, line 37 et seq.

See, in this regard, claims such as claims 35-44.

Baldo

The invention in Baldo is directed to an exciton blocking layer to enhance the efficiency of the Baldo OLED. Baldo merely pays little attention to the nature of the Baldo OLED, but does mention that the HTL, EL and ETL layers can be formed by thermal evaporation or spin coating if a polymer LED is used, the preferred method of depositing metal layers being by thermal or electron beam evaporation. Baldo, column 5, lines 46-53. In this regard, the Examiner's attention is directed to claims 10, 32, 45 (ortho-metallation complex; porphyrin complex).

With respect to the essential Baldo light emitting device, this appears to be essentially the same as in Moriyama and Onitsuka. See, in this regard claims such as claims 35-44.

Baldo, of course, contains no teaching whatsoever of the concept of the present invention.

Applicant present his traversal of the invention on two levels, the first level directed to claims 1-11 and 21-23, the second level being directed to new claim 24 et seq.

First Level of Traversal

Applicant first in general addresses the rejection over Moriyama in view of Onitsuka further in view of Tsai.

Applicant respectfully submits there is no motivation to combine Onitsuka and Tsai. The reason for this is that neither references teaches either expressly or implicitly the use of phosphorescent compounds. This is an important factor because the mechanism for luminescence of a light-emitting device with a light-emitting layer comprising a fluorescent material is different from the mechanism for luminescence of a light-emitting device comprising

a light-emitting layer containing a phosphorescent compound. This is quite clearly explained in the present specification. See the present specification at page 2, line 10 to page 3, line 28 and especially page 4, line 5-13. Since the combination of Onitsuka and Tsai does not find basis on this record, the rejection that the Examiner has posed is fatally defective and must fail. In this regard, Applicants respectfully submit that a broad conclusionary statement regarding the obviousness of modifying a reference, standing alone, is not evidence of unobviousness as is required to properly reject the claims of the present application.

With respect to the rejection over Baldo in view of Onitsuka further in view of Tsai, Applicant essentially predicates his rejection on the reasons above advanced.

Detailed Argument: Level 1 - the obviousness rejection of a Moriyama in view of Onitsuka further in view of Tsai

The Examiner urges that Moriyama teaches the detrimental effects caused by moisture and oxygen on an OLED but further admits that Moriyama is silent regarding the concentrations of moisture and oxygen within the sealed atmosphere and the specific steps of the sealing process. The Examiner states (present Action, page 3, bottom of first full paragraph):

“Moriyama teaches the detrimental effects caused by moisture and oxygen to the OLED (see Paragraphs [0019] and [0020]) but is silent regarding their concentrations within the sealed atmosphere and the specific steps of the sealing process.”

To overcome the above defects in Moriyama, the Examiner turns to Onitsuka.

In the Examiner's view, the combination of Moriyama/Onitsuka teaches the claimed invention but is simply silent regarding the preferred concentration of oxygen within the sealed atmosphere. See the present Action at page 4, first full paragraph on that page:

“Moriyama-Onitsuka discloses the claimed invention but is silent regarding the preferred concentration of oxygen within the sealed atmosphere.”

Applicant respectfully submits that the Examiner has incorrectly attached no weight and has ignored the element in the claims “**said light-emitting layer, said back side electrode** and said sealing parts are disposed in an atmosphere where both of a moisture concentration and an oxygen concentration are 100 ppm or less”.

Applicant respectfully submits that one searches Moriyama/Onitsuka in vain for any teaching or suggestion regarding the concentration of the atmosphere with respect to water **during the disposing step of a light-emitting layer and a back side electrode.**

What Onitsuka does disclose at col. 10, lines 58 to 65 is as follows:

“Since the procedures for forming the layers or films of the organic EL multilayer structure D10 on the substrate D1 may be the same as in the prior art, the description about these procedures is omitted herein. The following description is based on the assumption that the organic EL multilayer structure D10 has already been formed on the substrate D1.”

Onitsuka also discloses that the organic EL multilayer structure D10 includes a hole injecting electrode D11, a hole injecting and transporting layer D12, a light emitting layer D13, an electron injecting and transporting layer D14 and an electron injecting electrode D15 stacked on the substrate D1 in the described order. See Onitsuka at column 6, lines 56-60.

Onitsuka further discloses as follows at column 11, lines 2-6:

“The evacuation and inert gas injection are repeated several times until an inert gas atmosphere having a purity of 90 to 99.9%, especially 99.0 to 99.9% and a water content of up to 100 ppm, preferably up to 10 ppm, especially up to 1 ppm is established **in the chambers**” (bold added).

According to the method disclosed in Onitsuka, a plurality of organic EL multilayer structures D10 and shield members D20 or D50 are carried into fore-chamber 120. See Onitsuka

at column 11, lines 14-16. Thus, in accordance with Onitsuka, organic EL multilayer structures D10 (containing a light emitting layer D13 and electrodes D11 and D15) are **already made or constructed** before entering the chambers which have a controlled atmosphere. Onitsuka clearly thus does not teach or suggest any atmosphere for disposing **a light-emitting layer and a back side electrode**. Applicant respectfully submits that the broad conclusionary statement by the Examiner regarding the obviousness of modifying a reference is not adequate “evidence” to support the rejection as phrased by the Examiner.

Further, Onitsuka does not disclose or suggest the concentration of oxygen in the specific steps in Onitsuka, i.e., does not provide any teaching or suggestion of controlling the concentration of oxygen in the specific steps disclosed in Onitsuka. Accordingly, Applicant submits there is no motivation to combine Moriyama and Onitsuka to arrive at the presently claimed invention.

In addition to the above, Onitsuka does not disclose or suggest the use of a phosphorescent compound in a light-emitting layer, rather, Onitsuka discloses that the light-emitting layer contains a fluorescent material that is a compound having light-emitting capability. See Onitsuka at column 8, lines 22-35.

If the Examiner will refer to the present specification at page 4, lines 5-13, the Examiner will see that a phosphorescent light-emitting device utilizing triplet excitons is liable to be affected and quenched by moisture and oxygen in a manner quite different from a fluorescent light-emitting device utilizing singlet excitons. In this regard, it is well known and accepted in the art that oxygen in the ground state is in the triplet state.

Further, triplet excitons are very sensitive to oxygen. As a consequence, Applicants respectfully submit that a mechanism relating to processing a fluorescent light-emitting device would not be suggestive of any mechanism for processing a light-emitting device containing a phosphorescent compound. Due to the differences of luminescent mechanism between a fluorescent light-emitting device and a phosphorescent light-emitting device, there would thus be no motivation to combine Moriyama and Onitsuka with a reasonable expectation of success to reach the present invention. Quite clearly any reasonable expectation of success must be found in the prior art, not in Applicant's own disclosure, and it is submitted that in the present situation the "reasonable expectation of success" which must be a predicate for the Examiner's rejection is found only in Applicant's own disclosure.

In addition to the adverse effect of oxygen, it is also known that oxygen will have a positive effect on the fluorescent light-emitting device. For example, the Examiner is referred to US 6,104,137 (issued August 15, 2000) which discloses that when a filler gas containing at least one combustion supporting gas, such as oxygen, is used to enclose organic EL elements in a sealed manner, an organic EL element can be obtained which is free from the occurrence of short circuiting and which thus has enhanced reliability. See column 5, lines 52-57 of US 6,104,137.

The Examiner is further requested to refer to JP 10-208,880 (published August 7, 1988) which discloses that the content of oxygen in the atmosphere is desirably set at 20% volume percentage (see the attached Patent Abstract of Japan).

In total, US '137 and JP '880 support the conclusion that there is no motivation for one of ordinary skill in the art to combine Moriyama (dealing with a phosphorescent light-emitting

device) and Onitsuka (dealing with a fluorescent light-emitting device) with any reasonable success of arriving at the present invention.

“Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion of incentive supporting the combination.” *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987).

Applicant respectfully submits that what is lacking in the present situation is any reason, except hindsight based upon the present specification, that one of ordinary skill in the art would have found it obvious to combine Moriyama and Onitsuka. Since there is no basis for the combination of references, Applicant respectfully submits that the combination of references must fail.

The Examiner further asserts that Moriyama/Onitsuka disclose the claimed invention, simply being silent regarding the preferred concentration of oxygen within the sealed atmosphere. To remedy this defect in the prior art, however, the Examiner cites Tsai, stating in the present Action at page 4, end of the first full paragraph as follows:

“Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the inert gas of Moriyama-Onitsuka with an oxygen content of not more than 1 ppm, to avoid the adverse effects of oxygen which deteriorates the performance and decreases the lifetime of the device.”

However, this particular conclusion ignores the fact that Onitsuka, as earlier discussed, does not provide any teaching or suggestion to control the concentration of oxygen in the specific steps disclosed in Onitsuka and the fact that Moriyama fails to teach or suggest any specific steps of controlling oxygen in the specific steps as claimed herein. Even assuming *arguendo* that the combination of Moriyama/Onitsuka/Tsai would be possible, the combined teachings of these references do not teach or suggest, either explicitly or implicitly “**said light-**

emitting layer, said back side electrode and said sealing parts are disposed in an atmosphere where both of a moisture concentration and an oxygen concentration are 100 ppm or less.”

Applicant respectfully submit that, at best, that the Examiner’s statement that providing an inert gas in Moriyama/Onitsuka with an oxygen content of not more than 1 ppm would fall clearly within prohibited “broad conclusionary statements”.

Whether the Examiner relies on express or implicit teachings, the Examiner must provide particular findings relating to such express or implicit showings. See *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999), citing with approval *In re Fritch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) to the effect that an Examiner can satisfy the burden of obviousness in light of a combination of references “only by showing some objective teaching [leading to the combination]”, and citing *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985) for the proposition that combining prior art references without evidence of a suggestion, teaching or motivation to combine the references simply takes the Inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability -- the essence of hindsight: “The invention must be viewed not with the blueprint drawn by the Inventor, but in the state of the art that existed at the time.”

A careful review of Tsai shows that Tsai merely teaches:

Therefore, in the process for producing the organic electro-illuminiscent device, the demand for controlling the content of the water and oxygen in the atmosphere is strict, i.e., the required content of the water and oxygen therein is no more than 1 ppm.” (Tsai at column 3, lines 7-11)

Thus, at best, Tsai gives only general directions and teaches nothing more than that the required amount of the water **and** oxygen therein is no more than 1 ppm. Tsai in no fashion

teaches of suggests how to specifically design an apparatus/method which controls water **and** oxygen in the atmosphere being used during processing in the specific steps of a method for producing a light-emitting device as claimed in the present application.

Further, Tsai provides no guidance or direction of which process for producing any organic electro-luminescent device is critical and likely to be successful for controlling moisture and oxygen concentration.

Applicant respectfully submits that what has occurred in the present situation is a picking and choosing of many features from individual references which represents the essence of impermissible hindsight. Applicant respectfully submits that the Examiner has improperly relied upon the teaching in the present application for a suggestion to combine Moriyama, Onitsuka and Tsai in the manner proposed by the Examiner.

Withdrawal of the rejection over Moriyama/Onitsuka/Tsai is respectfully requested.

The Obviousness Rejection Over Baldo in view of Onitsuka Further in View of Tsai
- First Level Traversal

In the Action at page 6, first full paragraph, with respect to Baldo, the Examiner states as follows:

“Baldo is silent regarding the limitation of “disposing sealing parts to isolate said one or more organic layers from external air, wherein said sealing parts are disposed in an inert gas atmosphere where both of a moisture concentration and oxygen concentration are 100 ppm or less”.”

Despite the above admission regarding the deficiency of Baldo, the Examiner turns to Onitsuka and Tsai to remedy these defects in Baldo.

For the same essential reasons regarding the rejection based on Moriyama in view of Onitsuka further in view of Tsai, Applicant respectfully submits that the combined teachings of Baldo/Onitsuka/Tsai do not suggest in any fashion “**said light-emitting layer, said back side electrode** and said sealing parts are disposed in an atmosphere where both of a moisture concentration and an oxygen concentration are 100 ppm or less.”

It is believed that the reasons earlier advanced with respect to the Moriyama/Onitsuka/Tsai rejection apply with equal force to the present rejection, and mandate withdrawal of the rejection.

Second Level of Traversal

The Invention

Applicants now emphasis in certain claims the wet-coating aspects of the present invention. They further emphasis the function of disposing steps in the claims. Finally, they emphasis that the present invention finds particular application to phosphorescent EL devices based upon triplet excitons.

Traversal of the Rejections

Prior to traversing the rejections, Applicants wish to emphasize that they now use in certain claims “consisting essentially of” language to define the method of the present invention. This language is meant to exclude steps which would be contrary to the novel and unobvious aspects of the present invention, i.e., which would go against the spirit of the disposing steps of the present invention where the moisture and oxygen contents are controlled to certain limits in the method of the present invention.

Applicants respectfully submit that the “consisting essentially of” language clearly avoids prior art such as Moriyama (provide an oxygen adsorbent disposed between the substrate and the second electrode of the organic EL device) and Baldo (providing an exciton blocking layer).

In view of the exclusion of prior art such as Moriyama and Baldo, Applicants respectfully submit that an essential predicate, namely the primary references necessary to support the Examiner’s rejection, is lacking, and withdrawal of the rejections is proper.

However, assuming *arguendo* the combination would be made, though Applicants strenuously urge this would not be apparent to one of ordinary skill in the art, Applicants specifically address claims such as claim 35 and claim 36, especially claim 36, where the hole-injecting layer, the light-emitting layer and the electron-transporting layer are all formed by a wet film forming method.

These steps are not suggested in Moriyama. For the reasons earlier advanced, these steps are alien to Onitsuka. Certainly Tsai does not teach any wet-coating method for the layers cited in claim 36. The teaching in Baldo is too diffuse and vague to teach the limits of claim 36.

Accordingly, for claims which are limited to wet-coating for the present invention, Applicants respectfully submit the rejections are clearly improper and should be withdrawn.

With respect to claims such as claims 35-44, note the earlier discussion regarding the references with respect to these claims, clearly not taught by any combination of the prior art.

With respect to claim 45 calling for an *ortho*-metallation complex or a porphyrin complex, see earlier discussion regarding triplet excitons. Clearly the subject matter of claim 45 is not taught by any combination of references for use in the **method** of the present invention.

Finally, note claim 46, a new independent claim. No prior art remotely suggests the limits of claim 36.

With respect to the language “substantially solely due to said inert gas atmosphere”, Applicants respectfully submit that this limitation is proper in view of the specification where it is quite clear that it is the inert gas atmosphere having the controlled water and oxygen contents which leads to the results of the present invention in avoiding the disappearance of triplet excitons. In this regard, it is believed that the Examiner will agree that the primary references, Moriyama and Baldo, in no fashion suggest this aspect of the claims. In fact, Moriyama and Baldo take an entirely different approach to the problems solved by those patents. Onitsuka has been earlier discussed and distinguished. Tsai uses an oxygen and water barrier layer. Thus, Tsai cannot suggest this limit of the claims.

With respect to the combination of references, Moriyama provides an oxygen adsorbent. On the other hand, Baldo provides an exciton blocking layer. One of ordinary skill in the art would not be lead to modify Moriyama or Baldo in view of Onitsuka since Moriyama provides its own approach to the Moriyama problem while, on the other hand, one of ordinary skill in the art would not have a suspicion as to whether Baldo’s exciton blocking layer would lead to any problems due to moisture and oxygen. Thus, there would be no motivation to combine Moriyama and/or Baldo with Onitsuka. Even if combined, there will still be a lack of teaching of the wet forming method of the present invention.

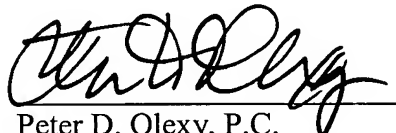
AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/000,323

With respect to Tsai, Tsai is concerned with plastic substrate problems, not with problems from the external environment as in the present invention. Thus, Tsai does not remedy the defects of the other references.

It is respectfully submitted that the Examiner has taken the teaching of Tsai, **as applied to the present claims**, and has expanded the teaching of Tsai beyond what one of ordinary skill in the art would gleam from Tsai.

Withdrawal of all rejections and allowance is requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Peter D. Olexy", written over a horizontal line.

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23373

CUSTOMER NUMBER

Date: June 17, 2005



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-208880

(43)Date of publication of application : 07.08.1998

(51)Int.Cl.

H05B 33/10
C08K 11/06
G09F 9/30
H05B 33/26

(21)Application number : 09-012294

(71)Applicant : TORAY IND INC

(22)Date of filing : 27.01.1997

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(54) LIGHT EMITTING ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic layered thin film light emitting element, which can maintain the light emitting efficiency in the atmosphere of oxygen and which can be stably driven for a long time in any atmosphere, by interposing a layer, which includes a material for emitting light, between a positive electrode and a negative electrode, and aging the light emitting element with the electric energy in the atmosphere of oxygen.

SOLUTION: Characteristic of an organic layered thin film light emitting element can be stabilized without lowering the light emitting efficiency by performing the constant current aging for a short time in the atmosphere of oxygen at a low current density. Content of oxygen in the atmosphere is desirably set at 20% of volume percentage. Non-light emitting phenomenon and luminance lowering phenomenon due to the generation of short circuits can be restricted for a long time, and stabilized light emitting luminance and stabilized driving voltage can be maintained, and practical and reliable display is realized.

LEGAL STATUS

[Date of request for examination] 09.01.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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